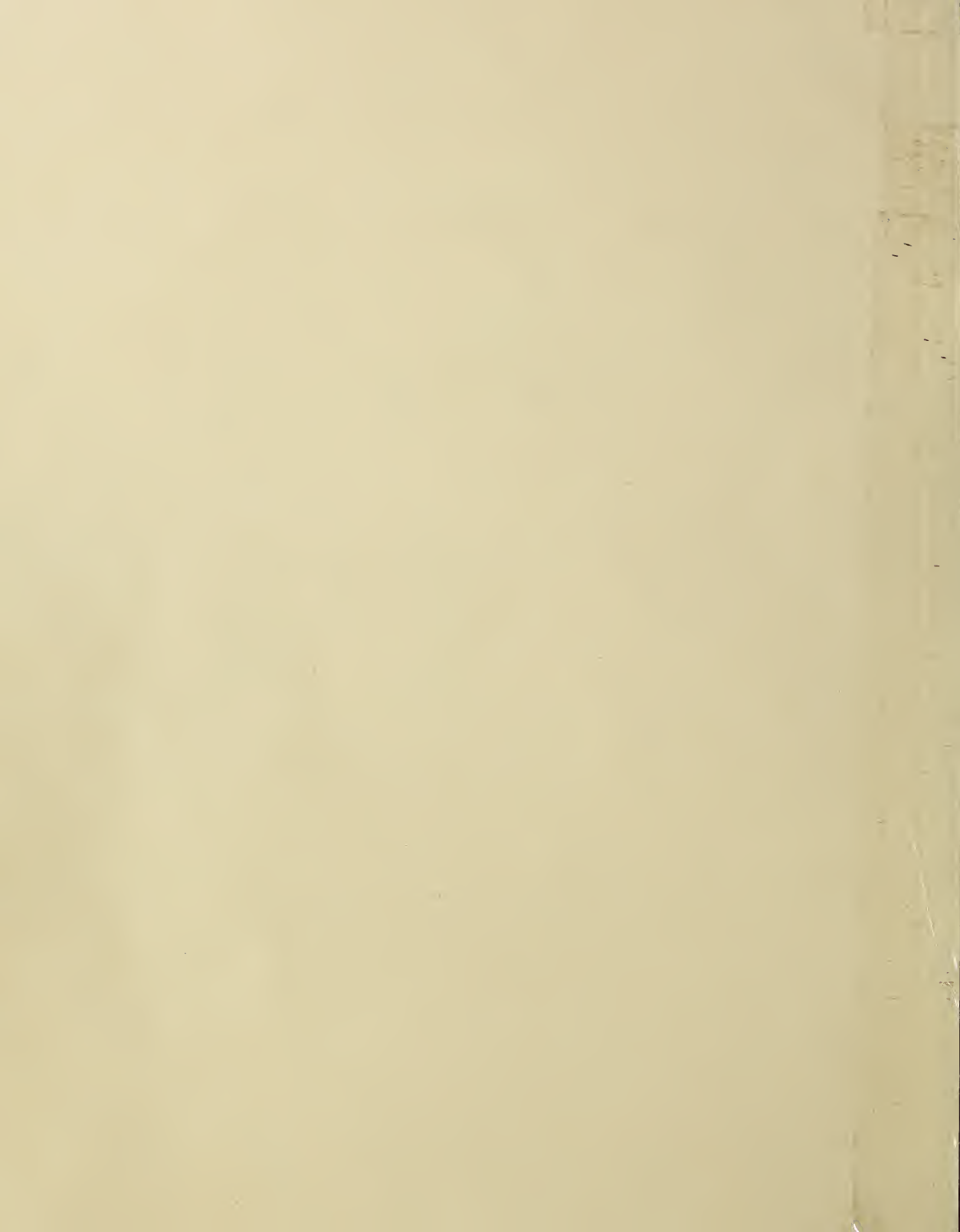


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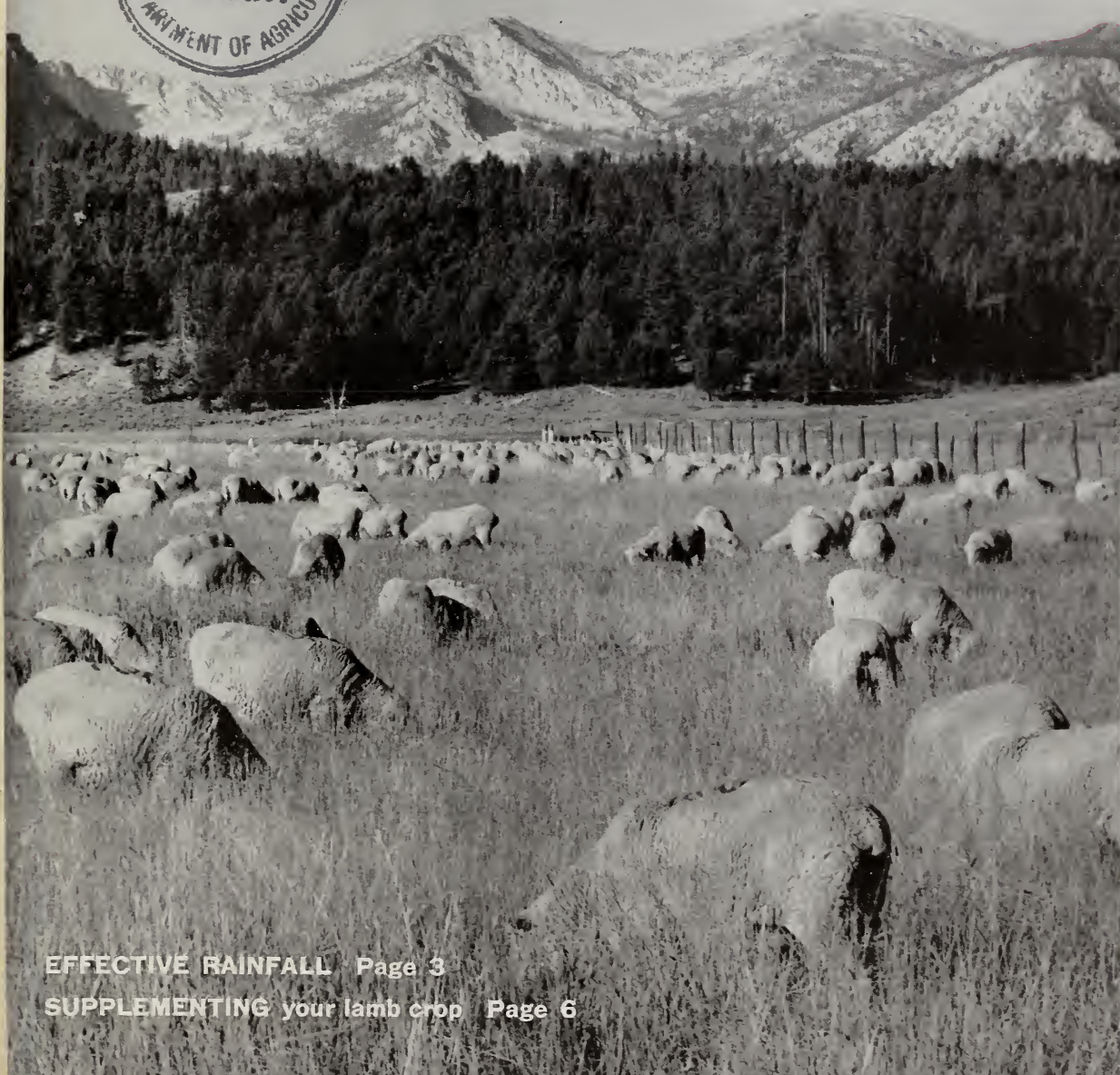
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Editor: S. S. English.

Managing Editor: R. E. Enlow.

Contributors to this issue:

*B. R. Blankenship, E. J. Fitzgerald,
D. W. Goodman, W. W. Martin, D. H.
Mayberry, J. R. Parker, R. E. Prescott,
S. D. Rosen, H. H. Smith.*

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Triangle for Success

Two Ohio brothers, who are partners in dairy farming, have acclaimed good breeding, feeding, and management practices as the three sides of their "triangle of success." We believe that most successful producers of livestock—be it cattle, hogs, or sheep—endorse this view.

And so it is, too, with agricultural scientists. Traditionally, they have sought (with success) to advance livestock production efficiency by improving feeding, breeding, and management practices.

Typical of this approach is a current ARS study to learn if meat from bulls raised to yearlings might have a market in this country. If young bull meat proves as tasty and tender as that of steers, cattlemen could profit from the increased weight gains and decreased management involved in raising bulls instead of steers. Thus, they could bolster their "triangle for success."

The Ohio dairymen are directly concerned with work at Beltsville in the largest and most automatic energy metabolism laboratory in the world. There, cows are enclosed in glass compartments to find out how they use feed to make milk. This research will lead to improved efficiency by teaching us a great deal about the real value of various feed combinations.

The producer of pork will be equally concerned in results from hog-breeding studies at Beltsville (see article on page 10). During seven generations of selective hog breeding, ARS animal husbandmen increased the proportion of lean cuts among hogs chosen for thin backfat by 4 percent over those picked for thick backfat. And more lean meat was produced on less feed. The seventh-generation lean-type hogs used a third less feed from birth to 140 days than the seventh-generation fat-type did..

Many other research projects on feeding, breeding, and management are in progress at Beltsville and cooperatively with State agricultural experiment stations. Directly or indirectly, the resulting research-based practices help reduce production expenses, which last year averaged 70 percent of gross income on American farms.

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EFFECTIVE RAINFALL

Meteorologist studies amounts of rainfall that actually benefit plants

■ An ARS meteorologist is using electronic computers to answer a question important to irrigation engineers:

How much of the rain that falls during the growing season actually benefits plants?

D. M. Hershfield, of the U.S. Hydrograph Laboratory, Beltsville, Md., points out that a significant part of total rainfall may not contribute to crop growth. Water striking saturated soil drains away. And some of the water entering the soil percolates beyond the reach of roots.

Climate and soil conditions determine "effective rainfall," which is that

part of total rainfall held in the root zone.

Data on effective rainfall would be valuable to the engineer in determining irrigation water requirements and in designing canals and storage structures. To determine water requirements, he could merely subtract effective rainfall from total water needs of irrigated crops at the location.

Records are kept at 22 locations

Hershfield determines effective rainfall by "keeping books" on daily soil-moisture status, under assumed typical conditions, at 22 locations in

the United States. His computations include additions to soil moisture, by rainfall and irrigation, and hypothetical soil-moisture losses.

Rainfall amounts are obtained from daily U.S. Weather Bureau records at each location. Estimates of water used in plant-growth processes and evaporation, for the local combinations of soil and crops, were provided by irrigation specialists of USDA's Soil Conservation Service.

The computer was programmed to calculate daily moisture status under each set of assumed conditions. The procedure is similar to the way a

Turn Page

EFFECTIVE RAINFALL

(Continued)

bookkeeper balances his daily ledger, except that the commodity is soil water instead of dollars.

Starting with assumed stored soil moisture on the first day of the growing season, the computer debits moisture on hand by the estimated amount of water used each day, leaving a smaller balance. If weather records show rainfall on a specific date, the amount of rainfall is added to total moisture before striking that day's balance.

When soil moisture drops to a predetermined point at which irrigation would be required, the computer is programed to add the equivalent of a typical irrigation before determining the day's balance.

If water in the soil, plus rainfall, exceeds the soil's estimated moisture-holding capacity, the excess is tabulated as rainfall that does not contribute to plant growth. The same procedure is followed when a heavy rain occurs shortly after a programed irrigation and produces more water than the soil can hold.

Calculating effective rainfall

The computer keeps a running record of excess water. This amount is subtracted from total rainfall to calculate the percentage of total precipitation that is effective—that contributes to plant growth.

Computations can be made for one growing season or any number of seasons up to the 50-year span covered by weather records at the 22 locations studied. Hershfield made separate computations, assuming minimum water use by crops on the one hand and maximum on the other. These compu-

tations were then made in combination with varying rates of irrigation.

For example, when he assumed maximum use of water by a crop in combination with 3-inch irrigations, he obtained the following percentages of total rainfall that were effective: 68 percent at Baton Rouge, La.; 70 percent at Thomasville, Ga.; 72 percent at both Dover, Del., and Avon Park, Fla.; 87 percent at Denver, Colo.; 88 percent at Billings, Mont.; 91 percent at Phoenix, Ariz.; 94 percent at Albuquerque, N. Mex.; and 96 percent at Ephrata, Wash.

Importance of local conditions

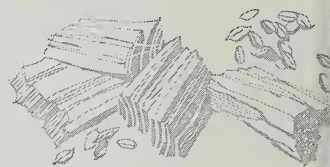
The percentage of total rainfall that is effective depends on the relationship of numerous climatic and geographical characteristics. The amount of rain received, in relation to water use, is a major consideration. Water use, in turn, depends on the rate of evaporation and transpiration and on the water-holding capacity of the soil.

Where both rate of usage and storage capacity are large, relative to rainfall amount, all rainfall is stored in the soil. In dry regions of the West, nearly all rainfall is effective.

Hershfield also calculated the number of irrigations required for crop production at the locations studied. For example, in 29 years of the 1911-1960 period, two 2-inch irrigations would have been required in June in the vicinity of Denver, Colo., for a crop with the highest water consumption. At the same location, but with 4-inch applications, only one June irrigation would have been needed in 35 of the 50 years.★

A NEW LINK IN STRONGER PAPER

Peoria researchers apply sulfur linkages to increase cereal derivatives in paper



■ Promising ways to use new cereal derivatives in the manufacture of paper and fiberboard are coming from work at the Northern utilization research laboratory, Peoria, Ill.

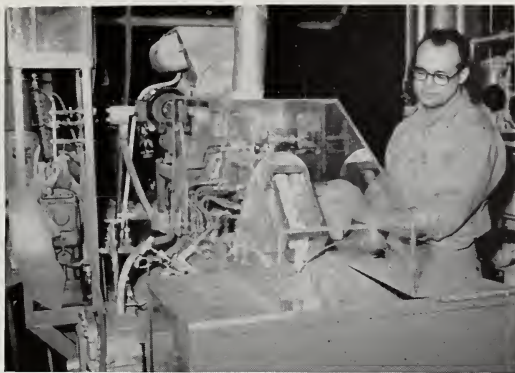
ARS chemists there have found a way to use large amounts of cereal derivatives with wood pulp in making paper and at the same time add strength to paper and fiberboard.

The key to their success is sulfur linkages, which in nature give hair, wool, horns, and hooves their insolubility and dimensional stability in water.

Research at Peoria has demonstrated that introducing sulfur links into starch and other cereal products is both technically possible and industrially promising. To realize the promise, however, much developmental work remains to be done.

Until this discovery, use of starch in papermaking has been limited because (1) retention of starch on pulp fibers decreases rapidly after the pulp has absorbed about 1½ percent of its weight of starch, and (2) paper becomes brittle when more than 6 percent of ordinary starch is added.

To overcome these restrictions, the



Chemists at the Northern utilization research laboratory, Peoria, Ill., have found a way to increase the content of cereal derivative in paper. The process, being studied in a pilot plant (left), causes a permanent, water-resistant bond between molecules of cereal starch or protein. A sample of a new high-starch paper is tested (right) for increased tensile strength.

Peoria scientists set out to find a reaction that would cause a permanent, water-resistant bond between molecules of cereal starch or protein and that would meet cost requirements and application conditions of pulp-product industries.

Cereal xanthide gives best results

They have reached the first part of this goal by developing from water-soluble cereal xanthate (CX) two cross-linked, insoluble cereal derivatives—cereal xanthide (CX-XC) and cereal-metal xanthate (CX-M-XC). Best results thus far have been with cereal xanthide in paper and cereal-metal xanthate in fiberboard.

The first phase in the process—the formation of cereal xanthate—is the introduction of sulfur into the component molecules of the cereal starch or protein. This is done at room temperature by mixing carbon disulfide and sodium hydroxide (lye) with ground whole wheat, flour, bran, or starch to form a slurry. This mixture is stirred continuously until a stiff gel, cereal xanthate (CX), is formed.

In the next phase, cereal xanthate is cross-linked to form cereal xanthide

or cereal-metal xanthate. In this cross-linking, a bond is formed from the sulfur in one molecule to the sulfur in an adjacent molecule. Cereal xanthate may be cross-linked alone or in the presence of pulp fiber.

To form cereal xanthide (CX-XC), an oxidizing agent such as chlorine is stirred into a cereal-xanthate solution having a pH of about 7. To form cereal-metal xanthate (CX-M-XC), a heavy metal salt such as zinc chloride is reacted with cereal xanthate.

If the soluble xanthate is mixed with pulp in water and then the cross-linking agent is added, the insoluble xanthide or metal xanthate precipitates on the pulp fibers.

10 times the amount of starch

Paper containing as much as 44 percent of cereal xanthide has been made in preliminary studies at the Peoria laboratory. This is more than 10 times the maximum amount of starch—about 4 percent—now used in paper.

The Peoria chemists say that paper strength, except resistance to tearing, generally increases as the addition of

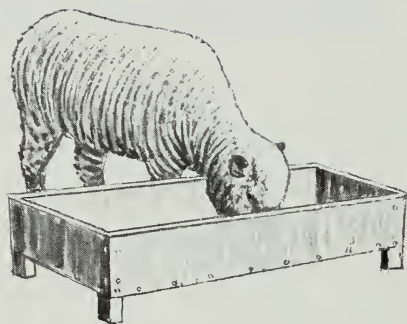
cereal xanthide is increased to the 20-percent level. After that it usually decreases. In some experiments, however, the strength increases continued until the content of cereal xanthide reached the 40-percent level.

The addition of cereal xanthide to pulp causes other changes also: Normally slow-draining pulps drain free of water faster; paper becomes more transparent; and the paper's resistance to water penetration increases.

Experimental insulation board made with 10 percent of cereal-zinc xanthate was more than twice as strong as commercial insulation board of equal density. At the 10-percent level, all of the cereal-zinc xanthate was retained in the board.

The preliminary studies show the general promise of these sulfur-linked cereal derivatives for strengthening pulp products. Further work will be directed toward (1) the evaluation of different cereal xanthides and cereal-metal xanthates relative to specific properties of different papers and fiberboards; (2) the development of pilot-plant processes; and (3) the evaluation of the cereal-derivative paper and board for end uses.★

Those ewes that received a supplementary ration before breeding averaged 1.43 lambs per ewe. This compared with 1.27 lambs per ewe among those that did not receive a supplementary ration.



Supplemental feeding can add lambs, depending on kind of feed, timing, breed, age of ewe

SUPPLEMENTING your lamb crop

■ Feeding ewes a supplementary ration to increase the lamb crop can be worthwhile or wasteful—depending on how it's done.

Preliminary studies by ARS in cooperation with the University of Idaho show that the value of this practice, called flushing, is influenced by (1) the ewe's age, (2) the length of the flushing period, (3) the breed of sheep, and (4) the supplement used.

The research was done by animal geneticists C. V. Hulet and S. K. Ercanbrack, animal nutritionist D. A. Price, and animal husbandmen R. L.

Blackwell and R. D. Humphrey at the U.S. Sheep Experiment Station, Dubois. Here's what they found:

Age of ewe—Flushing increased lamb production among most ewes except the 2-year-olds.

Flushing period—A 17-day pre-breeding flushing period proved best in a comparison of lamb production from mature Columbia and Targhee ewes. Three groups of these ewes received supplemental feeding; a fourth was maintained as a control. The

supplemental feeding was started 17 days before breeding, but the length of the flushing period was varied.

The first group, flushed for 17 days before breeding started, averaged 1.43 lambs per ewe. The second group, flushed an additional 17 days after breeding started, produced no more than the first group but required twice as much supplemental feed. The third group, flushed an extra 34 days after breeding started, had only 1.35 lambs per ewe, even though this group received three times as much supplement. The fourth group, which

received no supplement, averaged only 1.27 lambs per ewe.

Hulet believes prolonged supplemental feeding during the breeding season endangers embryos that are developing in the ewes.

Sheep breeds—Flushing increased the lamb crops of Columbia and Targhee ewes but had little effect on Rambouillet lamb production. Hulet says the Rambouillets, which had been pastured on the same range as the other breeds, were getting enough feed for maximum lamb production without a supplement. Two reasons might explain why the Rambouillets were in condition for maximum lamb production on range: (1) They may require less feed for maximum lamb production than Columbias and Targhees, and (2) they may be better foragers.

Kind of supplement—Oats fed at the rate of 0.7 pound per head daily accounted for the increases in lamb production. In similar trials, with alfalfa pellets—fed at the rate of 1.0 pound per head daily—increases in lamb production were insignificant.

How does flushing affect lamb production? When ewes have not been getting an ideal ration, Hulet believes, increasing their energy intake or feeding them specific nutrients somehow stimulates the development of the ovarian follicles, which release egg cells. The ewes apparently need this stimulation only for a relatively short time early in the estrus cycle, when follicles are developing. Stimulation by flushing late in the cycle is ineffective, probably because the number of eggs to be released by the ovary has already been determined.☆

NEW CHINESE CHESTNUTS

■ Two new orchard varieties of the blight-resistant Chinese chestnut—the only chestnut that can be grown in the Eastern United States—have been released to commercial nut growers and nurserymen for vegetative reproduction.

These new varieties, named Crane and Orrin, are superior in keeping quality and flavor to all varieties of Chinese chestnuts now grown east of the Mississippi. They were selected and tested at Beltsville, Md., by ARS nut breeder J. W. McKay.

Chinese chestnuts were introduced years ago by USDA scientists to fill the void left by the chestnut blight in the early 1900's, which destroyed America's native chestnuts. Italian chestnut varieties are grown in blight-free California, but growers in the blight-contaminated East must still depend on the Chinese varieties.

McKay examines burrs on one of the orchard-type Chinese chestnuts he developed.



Chestnuts of the Crane variety are in the burr; those of the Orrin variety have been husked.



The new Crane chestnut was named for H. L. Crane, a USDA scientist (now retired), who worked for many years in selecting blight-resistant Chinese varieties for orchard raising. The Crane chestnut was tested at various locations in Louisiana and Maryland. Grafted trees usually start to bear the second year after planting.

The Orrin variety was named in honor of the late Orrin S. Good, a Pennsylvania chestnut producer from whose orchard it originated. Good asked ARS to propagate and evaluate the chestnut for commercial use.

The Orrin may be suitable farther north than other blight-resistant varieties. It flowers later and matures earlier.☆

SHRUBS



NONSALINE—Lantana, rose, and spreading juniper were normal after 2 years where no salts were added.

■ When roses die, and many other shrubs lose their leaves or fail to grow, these symptoms may be a warning to southwestern homeowners that harmful amounts of salt (sodium or chloride salts, especially) have accumulated in their garden soils.

ARS research offers two solutions to this salinity problem: (1) Flood the area around the plants to wash accumulated salt out of the topsoil, or (2) plant only salt-tolerant shrubs.

On many soils, flooding to leach out the salt will permit damaged ornamentals to resume healthy growth. But slowly permeable and sodic (alkali) soils cannot be leached satisfactorily. Nor is flooding always practical where the water supply is short.

The extent of potential salt damage to ornamental plantings in the South-

west is indicated in reports of soil analyses made for homeowners. In some areas, testing laboratories report that a high proportion of the soil samples shows moderate to high salinity levels.

Other causes of leaf injury

Salt injury, however, is not the only cause of browned leaf margins and tips, loss of leaves, failure to grow, or death of shrubs. Scientists say these symptoms can indicate damage by hot, dry summer winds or inadequate irrigation. Periodic browning and dropping of old leaves also occur normally on healthy plants.

Homeowners can now choose several tolerant or moderately tolerant ornamentals for locations where excess salt accumulation cannot be easily removed. Research at the

U.S. Salinity Laboratory, Riverside, Calif., has determined relative salt tolerance of 12 ornamental shrubs commonly grown in the Southwest, in this order:

High tolerance: Oleander (*Nerium oleander*) and bottlebrush (*Callistemon veiminalis*).

Moderate tolerance: Arbor vitae (*Thuja orientalis*), spreading juniper (*Juniperus chinensis*), Lantana camara, *Pyracantha graberi*, *Pittosporum tobira*, *Xylosma senticosa*, Texas privet (*Ligustrum lucidum*), and winter-flowering viburnum (*Viburnum tinus robustum*).

Low tolerance: Pineapple guava (*Feijoa sellowiana*) and rose.

Tolerance ratings are based on the ability of shrubs to grow and develop as attractive plants in salty soil. Moderately reduced growth in shrubs

FOR SALINE SOILS

Study of 12 ornamentals offers guide to southwesterners



MEDIUM SALINE—After 2 years under medium salt conditions, the lantana had died, the rose was dying, and the juniper showed moderate tolerance.



HIGH SALINE—All three plants—lantana, rose, and spreading juniper—were dead at the end of the 2-year period under high salt conditions.

may not be undesirable if foliage is not seriously damaged. In the Riverside experiments, leaf injury to the highly tolerant oleander was negligible, although its growth was restricted in high-salt plots.

Survival doesn't mean tolerance

Survival alone is not a sufficient basis for judging shrub tolerance. Some species, such as pittosporum and privet, managed to survive where salinity was high, but the plants were dwarfed and unattractive.

Plants may not show for some time that they have been weakened by moderate or high salinity. Lantana appeared highly tolerant during the first growing season of the 2-year experiment. But the plants were frozen to the ground in November, and none recovered in the high-salt plots in the

U.S. Salinity Laboratory experiments.

The salt tolerance of the 12 species was determined by ARS plant physiologist Leon Bernstein, who grew the shrubs in irrigated field plots under nonsaline, medium-saline, and high-saline conditions. The plants were allowed 7 weeks to become established; then the salinity levels were gradually built up by adding sodium and calcium chlorides to the irrigation water.

The shrubs were also grown in automatically irrigated sand cultures containing moderate concentrations of sodium chloride, sodium sulfate, calcium chloride, or mixed chloride salts, as well as no salt. This experiment was to determine specific sensitivity to sodium and chloride. Some plants can tolerate a rather wide range of salt combinations but are readily

injured by sodium or chloride.

Well-defined leaf injury

Almost all species showed well-defined symptoms of leaf injury associated with chloride injury. Severe chloride injury occurred early on roses, viburnum, and guava. Sodium injury was especially pronounced on roses, pyracantha, viburnum, and xylosma; pittosporum showed limited sensitivity to sodium. Other species gave no sign of specific sodium injury during the 2-year experiment.

Bernstein concluded that reaction of shrubs to salinity depends on both the composition and the concentration of accumulated salts in the soil. Chloride and often sodium are specifically injurious to shrubs, just as they are to many nut crops and other woody plants. ☆

SEVENTH- GENERATION LEANNESS

Hogs selected for thin backfat yield 4 percent more lean cuts on less feed

■ Results of breeding Durocs selectively for seven generations at Beltsville, Md., underscore the value of breeding hogs for leanness. This selective breeding increased feed efficiency and produced leaner pork and a higher percentage of desirable cuts.

In experiments at the Agricultural Research Center, one line of hogs was bred and selected primarily to increase backfat thickness and another to decrease backfat thickness. A third line was maintained as a control.

Nearly one-fifth decrease in backfat

Backfat thickness averaged about 1.50 inches in the foundation stock used in the experiment. In seven generations, this thickness decreased about 18 percent to 1.22 inches in the low-fat pigs. Backfat thickness in the high-fat pigs increased to 2.01 inches, or about 35 percent. In the control line, it remained fairly constant.

ARS geneticist H. O. Hetzer, who led this study, says that commercial hog producers can easily reduce backfat thickness more than 18 percent in seven generations by buying superior replacement boars. The source of boars was limited in the Beltsville study because the animals were raised, not purchased.

Gains made on one-third less feed

Feed efficiency data show that seventh-generation pigs selected for thin backfat required only 307 pounds of feed per 100 pounds of gain from

birth to 140 days of age. Control-line pigs required 313 pounds of feed, and high-fat pigs required 337 pounds.

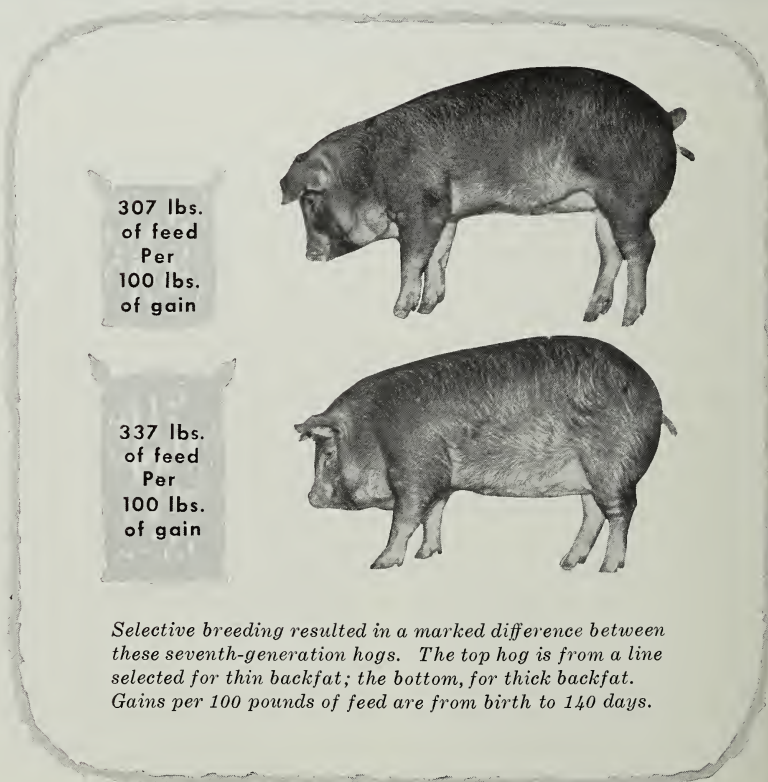
The scientists are now studying weaning-to-market feed efficiency of the selected lines.

The daily gain from weaning to live weight of 175 pounds was somewhat

higher (1.44 pounds) for the low-fat pigs than for the high-fat pigs (1.38 pounds).

Hogs yield 41.4 percent lean cuts

Carcass data also favored the leaner pigs. Their carcasses averaged more than 4 percent higher in yields of lean cuts (41.4 percent) than the carcasses



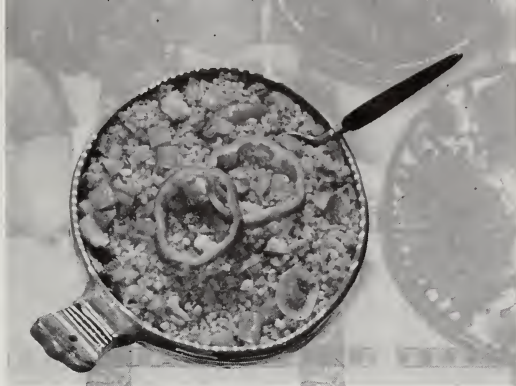
of high-fat pigs (37 percent). The lean-cut average was more than 2 percent higher than that of the control pigs, which yielded 39.2 percent lean cuts. The low-fat pigs produced pork chops with more lean meat—3.94 square inches of loin-eye-muscle area, compared with 2.65 square inches in the high-fat pigs and 3.68 square inches in the control pigs. Their hams were also heavier and leaner, averaging 16.3 pounds of which 59.8 percent was lean meat, compared with 14.6-pound hams containing 51.6 percent lean in the high-fat pigs. The low-fat hams were nearly 1 pound heavier and contained 3 percent more lean meat than the control hams, which averaged 15.6 pounds with 56.8 percent lean meat.

Similar results with Yorkshires

Hetzer obtained similar results from selective breeding of Yorkshire hogs through five generations. In the Yorkshires, the high-fat pigs had a slightly higher average daily gain than the low-fat pigs, but the low-fat pigs gained weight more efficiently. Other traits in high- and low-fat Yorkshires showed changes similar to those in high- and low-fat Durocs, although the differences between the high- and low-fat Yorkshire lines weren't as large. Apparently the Yorkshires used in the study were less variable genetically than the Durocs, Hetzer says.

Among the principal benefits of selecting for low backfat thickness have been increased feed efficiency, leaner pork, and a higher percentage of desirable cuts.

To realize the benefits of breeding for leanness, Hetzer suggests that hog producers buy replacement boars that have tested low in backfat and breed them to the leanest females in the herd. ☆



Bulgur may be prepared in many different ways—in a Spanish casserole (left) or in soups, salads, stuffings, and desserts.

A NEW WAY TO PROCESS BULGUR

■ An inexpensive, continuous process is now available for the manufacture of bulgur, a nutritious food made from wheat.

ARS engineers developed this new process as part of a national effort to increase the use of wheat in this country and foreign lands.

Bulgur is an ancient all-wheat food of Near Eastern origin. It can be served in a number of ways—with meats, as pilaf, or in soups. It keeps well and has a mild flavor. A special advantage of bulgur is its ease of preparation. It can be softened with meat juices or other liquids in 20 minutes.

In the traditional small-scale batch process of making bulgur, the wheat is soaked, cooked, dried, milled slightly to remove outer bran, and cracked.

In the continuous process these steps are carried out in readily available equipment, which can be varied in size to obtain the production rate desired. The usual cleaning in grain separators is the first step, followed by washing in sprays of water.

The next steps, soaking and cooking, required detailed study by G. S. Smith, E. J. Barta, and

M. E. Lazar, Western utilization research laboratory, Albany, Calif.

Their studies proved the feasibility of moving wheat in water by screw conveyors in U-shaped, heat-jacketed troughs through two stages of soaking, then through an insulated belt-type conveyor to equalize moisture content, and finally through a steam cooker on a wire-mesh belt.

The first soaking lasts for 30 minutes at temperatures beginning at 135° F. and rising to 155° F. The temperature rise for the second 30-minute soak is from 155° to 185° F. The second soaking trough is larger than the first because soaking swells grain.

The 30-minute tempering (to equalize the moisture content) is done at a temperature within the range of 170° F. to 185° F. The grain is then cooked for 15 to 20 minutes at 212° F.

The cooked wheat is dried, preferably, by passing it through a small rotary drier to remove the surface moisture before completing the drying in column-type grain driers. The dried grain is partially debranned in an abrasive mill and cracked in a burr mill. ☆

Researchers take a close look at . . .

Crownvetch for Pastures

■ The plant used to be considered a flower. Lately it's been used to fight erosion on hillsides and roadbanks. Next it might become a useful forage legume.

The plant is called crownvetch. It's a long-lived legume that persists in soils of low fertility and little moisture. Its deep, spreading roots and many lateral stems form a heavy mat that is excellent for controlling erosion.

But what about crownvetch's value for livestock? Until recently it was believed too bitter for livestock to relish. In the last 2 or 3 years, however, animals have been pastured on crownvetch in several areas with apparent success. Now a controlled feeding study by ARS scientists indicates that the plant is palatable to sheep—at least during one stage of its growth. It seems to be good for them, too.

The ARS study was done at the Agricultural Research Center, Beltsville, Md., by biochemist I. L. Lindahl, agronomist P. R. Henson, and research technician Charlie Jackson, Jr.

The animals were given a choice of two fresh-chopped forages—crownvetch that was harvested while in early bloom or a mixture of ladino clover and orchardgrass. During a 10-day test the sheep preferred the crownvetch; they ate 1.96 pounds (dry matter) per day, compared with 1.72 pounds of the mixture (dry matter). Longer feeding tests of crownvetch cut at other stages of growth are being planned.

The scientists also compared the digestibility of crownvetch cut when seed pods were forming with the digestibility of No. 2 alfalfa hay. Both forages were ground, pelleted, analyzed, and fed to sheep. The crownvetch contained about 41 percent total digestible nutrients, compared with about 49 percent in the alfalfa.

Producers report good grazing

There have been reports from areas where crownvetch has been planted to control erosion that the plant also makes good grazing for cattle. For example, a coal company in Ohio pastures feeder cattle during the

summer on 2,500 acres of crownvetch, which was planted on strip-mined land. These cattle reportedly make good weight gains. An Iowa producer of crownvetch seed reports good grazing when his seed fields are pastured in early spring.

The ARS scientists aren't yet recommending crownvetch as a forage. Even if further research shows the plant is excellent for livestock, other problems must be solved:

- Crownvetch seed is expensive. The plants don't produce many seeds, and the seeds have hulls that must be removed before germination is satisfactory.

- A stand of crownvetch is hard to establish. Seedlings are often weak. Once a stand is established, it is useful mainly for grazing. The plant doesn't stand up like alfalfa, so it's not easily harvested for hay.

Once established, however, crownvetch stays and spreads, often on ground too poor and dry to support alfalfa. The plant seems well adapted to most sections of the Midwest and Northeast.☆

This crownvetch was row-seeded in May. In November—less than 7 months later—it was spreading well to cover spaces between the rows.



The same crownvetch stand, 1 year old, has filled in the rows entirely. Crownvetch often grows on ground too poor and dry to support alfalfa.



Yellowing of Cottons . . .

Caused by residual skin oil in fabrics

■ Skin oil that accumulates in fabrics through repeated use and laundering is one of the causes of yellowing in white cottons.

Research by ARS textile chemists Verda McLendon and Florence Richardson at the Agricultural Research Center, Beltsville, Md., showed that skin oil is not completely removed by typical home-laundrying methods and that the unremoved oil gradually oxidizes and discolors the fabric.

Under the conditions of the study, two common household bleaches—sodium hypochlorite and sodium perborate—were effective in whitening fabrics containing skin oil. They

failed, however, to remove an appreciable amount of the oil.

Residual skin oil can be extracted from fabrics by laboratory methods not recommended for home use. Carbon tetrachloride removed about three-fourths of the oil that remained in laundered white cotton sheets and T-shirts, but it improved the color only about 28 percent. Ethyl alcohol removed the remaining one-fourth of the skin oil—and was responsible for about 72 percent of the total improvement in color resulting from extraction. These results showed that oxidized oil (the portion removed by the ethyl alcohol) is one of the causes

of yellowing of white cottons.

In soft water, no difference was found in the amount of skin oil remaining on articles that had been washed with soap and those washed with a synthetic detergent. (Hard water was not used in the research.)

Relatively high humidity was an important factor in yellowing of stored fabrics artificially soiled with substances similar to natural skin oil.

Research on the use of bleaches in home laundering is continuing. Scientists hope to be able eventually to recommend practical methods for preventing discoloration due to skin oil or from other causes.☆

Harvesting Bromegrass . . .

Study relates harvesting methods to seed quality

■ An investigation of the seed quality of Manchac smooth bromegrass harvested by different methods has resulted in several practical findings for seed producers:

(1) The windrow, or swather, method of harvesting has advantages over direct combining in obtaining peak-quality seed.

(2) The best time to cut smooth bromegrass by the windrow method is when the moisture content of the seed is 45 to 52 percent. When the direct combine method is used, moisture content of the seed should be approximately 24 percent.

(3) The immature seed (45 to 52 percent moisture) that remains attached to the stem in the window until it is air dried will ripen normally.

This ARS study of harvesting methods and their effect on seed quality was conducted by agronomist C. L. Canode and research assistant E. V. Horning, in cooperation with the Washington State Agricultural Experiment Station. The experimental harvesting schedule, extending from July 4 to July 26, permitted the scientists to sample seed under a wide variety of moisture conditions.

On the first day of harvest, the seed was in the milk stage, with a moisture content of 65.4 percent. On the last day, when shattering was intense, the seed was past the hard-dough stage and the moisture content was down to 12.5 percent.

The scientists waited 3 months after harvest before conducting germination tests in the laboratory and green-

house. By then, the seed had had time to dry and shrink the way it does in farm storage.

Seed harvested with a moisture content of 45 to 52 percent showed the best germination rate, seedling emergence, vigor, and shoot weight. At this early hard-dough stage, the seed is too moist for direct combining, but it is suitable for windrowing and then combining from the windrow.

Unfortunately, the best time for using the direct-combine method—when the seed contains 24 percent moisture—is also the time when seed shattering becomes significant in the field.

The scientists also found in this study that seed harvested by the windrow method tended to be heavier than seed taken by direct combining.☆

Thiabendazole . . .

New drug controls internal parasites of livestock

■ An experimental parasiticide, thiabendazole, has proved highly effective against several parasitic worms in cattle and sheep.

In limited tests conducted by ARS parasitologist Harry Herlich at Auburn, Ala., the drug proved practically 100 percent effective against five species of roundworms that infest cattle and five that infest sheep.

This drug, which was developed by industry chemists, is being tested by laboratories in many countries for use against some of the most destructive livestock parasites.

In the Auburn tests, no toxic reactions to thiabendazole occurred in any of the treated animals. Because the drug is still experimental, however, it is not yet recommended.

Thiabendazole was given to the animals orally at the rate of 55 milligrams per kilogram of body weight (about $\frac{1}{10}$ ounce per hundred-weight). This dosage was determined by previous tests in the United States, Australia, New Zealand, and Africa.

In cattle, the drug controlled common stomach worms, stomach hair-

worms, nodular worms, intestinal hairworms, and thread-necked strongyles. It was moderately effective against medium stomach worms. In sheep, the drug controlled the large stomach worm, intestinal hairworm, threadworm, and two nodular worm species.

Thiabendazole controlled immature worms of some species as well as adult worms. Other parasiticides, Herlich says, control the adult stages of some worm species but have little effect on the immature stages, which cause much of the harm. ☆

Cattle Lice . . .

Timed treatments, quarantine rid herd of pests

■ A practical method of eradicating cattle lice on a herd basis has been demonstrated in an experimental herd at the Agricultural Research Center, Beltsville, Md.

This eradication method, proved over a 5-year period, should be of value to livestock producers. Measures that effectively control but do not eradicate cattle lice have been in use many years.

Lice eradication in the Beltsville herd was carried out by entomologist D. W. Anthony, veterinarian L. O. Mott, and animal caretaker G. D. Mills. The success of the method, they say, depends on timing insecticide treatments to break the life cycle of the lice, plus quarantining and treating all newly introduced cattle.

To eradicate short- and long-nosed

cattle lice and cattle biting lice, all cattle in the herd were given two thorough sprayings, 14 days apart, with malathion, an insecticide used for louse control on nonmilking cattle. All cattle brought into the herd were kept in quarantine while receiving this 2-spray treatment. The study was made in the herd used for animal disease and parasite research.

Although most insecticides that are safe for use against lice on livestock will kill all lice past the egg stage, they are not completely effective against lice eggs, especially under pasture conditions, the scientists say. Therefore, some lice will hatch from eggs after the first treatment. The second spraying, if properly timed, kills these newly hatched lice before they can mature and produce eggs.

The Beltsville herd was first treated in October 1957. In the following months, no lice could be found on the animals. But to insure eradication, the herd again received the spray treatment the next April.

Periodic examination of the herd revealed no lice until October 1959, when a yearling heifer on pasture was found infested. Although cattle in the same pasture and in an adjoining pasture had no lice, both groups were given two sprayings. No lice have been found in this herd since the treatments, although about 90 animals have been added each year.

In May 1961, 118 animals from the herd were shipped to the National Animal Disease Laboratory at Ames, Iowa. This louse-eradication method is in use at Ames. ☆

AGRISEARCH NOTES

Stimulating saliva secretion

Saliva secretion can be stimulated in steers and sheep by introducing small amounts of fatty acids, salts, or water directly into the rumen, ARS animal husbandmen have learned.

This finding is important to scientists seeking a better understanding of the salivary mechanism in ruminants. Saliva, an alkaline fluid essential to digestion, helps neutralize acidity that develops in the rumen. Because of the trend toward using highly concentrated feeds, which increase rumen acidity, knowing how to stimulate saliva secretion may be vital to solving future nutritional problems.

D. A. Yarns and P. A. Putnam, in experiments at Beltsville, Md., used animals that had fistulas (openings) made in their throats and rumens. The scientists first measured each animal's normal salivation rate by draining saliva from the opening in its throat for several 10-minute periods. The salivation rate varied substantially with the animal.

Then the scientists slowly poured about half a pint of water, fatty acids, and salts, one at a time, through the fistula into the rumen. After each substance was added, the animal's salivation rate increased.

Yarns and Putnam expected the acids and salts to increase salivation by causing a chemical reaction in the rumen that would stimulate the salivary glands in the animal's mouth. But the fact that water also increased salivation indicates that some other stimulation is involved—instead of or in addition to a chemical reaction.

The scientists ruled out the possibility that psychological suggestion triggered the salivary mechanism.

Salivation did not increase when all the motions of adding the substances were followed without actually pouring them into the fistula. This result agrees with that obtained by other scientists—that ruminants don't salivate in anticipation of food as do animals that have only one stomach.

A record high for forage seed

The National Foundation Seed Project sold certified growers a record amount of foundation seed of superior forage crops in 1962. The year's distribution—354,584 pounds of foundation stocks—was nearly a third higher than the total for 1961.

Much of this increase was due to wider distribution of foundation seed of Vernal alfalfa, Lakeland and Penscott red clovers, and Gahi-1 and Starr Pearl millets. The project also distributed foundation seed of Atlantic and Narragansett alfalfas, Dollard and Kenland red clovers, Potomac orchardgrass, and Empire birdsfoot trefoil.

Foundation seed production must meet the strict requirements of State seed-certifying agencies that guarantee varietal purity to certified growers. The National Foundation Seed Project supervises the production of foundation forage seed and maintains close liaison between seed-producing and seed-using States. It also maintains reserves against the possible failure of a foundation seed crop. Normal reserves amount to 1 to 3 years' needs for foundation seed.

The project is cooperative among USDA, the State experiment stations, commercial seedsmen, and State foundation-seed organizations and seed-certifying agencies.

Daylilies respond to extra light

Supplemental light can be used to speed up blooming in forced daylilies, ARS plant geneticist Toru Arisumi has learned.

Arisumi's experiments at the Agricultural Research Center, Beltsville, Md., are the first studies of the effects light has on these plants.

Daylilies that bloomed earliest received 4 hours of supplemental light in the middle of each night. Other plants were given gradually increasing amounts of artificial light each night, in addition to natural day lengths. These also bloomed more quickly than daylilies exposed to natural day lengths alone.

The length of time daylilies are held in cold storage before forcing also influences the time it takes them to bloom. In general, the longer the plants are chilled, the later they bloom. Chilling, however, is less significant than the light cycle in affecting plant development.



The experiments included 6 daylily varieties: Vulcan, Caballero, and Kanapaha, all evergreens; Blonde Princess, a semi-evergreen; and Frosted Pink and Crimson Glory, which have deciduous foliage. The plants were all forced at 75° F. in the greenhouse after storage at 40° F.

The varieties differed in the time they required to flower. Averages for all 6 varieties were 79 days with 4 hours of supplemental light; 83 days with the gradual light treatment; and 88 days with only natural daylight.

OFFICIAL BUSINESS

AGRISEARCH NOTES

Deep plowing sandy soil

Deep plowing to bring clay subsoil to the surface will not, by itself, keep wind from eroding sandy soil on the southern half of the Great Plains. Beneficial effects will be temporary unless deep plowing is supplemented by other erosion-control practices such as crop-residue mulching, strip cropping, or tillage to maintain a cloddy and rough soil surface.

These conclusions were reached by scientists of ARS and the Kansas Agricultural Experiment Station in work cooperative with the Texas Agricultural Experiment Stations.

Deep plowing helps control erosion by increasing the number of surface clods 0.84 millimeters in diameter or larger, which are not easily eroded by wind. The practice is limited to areas where sandy topsoil is underlain by subsoil containing 20 to 40 percent clay. Plowing must be done carefully on solid blocks of land—not in a strip pattern. The plow should penetrate at least 1 inch



of subsoil for each 2 inches of sandy topsoil. This means that the furrow will often be 20 to 24 inches deep. The soil should be completely turned over to bring subsoil to the surface without mixing it with topsoil.

The deep-plowing studies were con-

ducted on two 4-acre plots of Amarillo loamy fine sand in Texas and on 29 Kansas fields (40 acres or larger) of Dalhart fine sandy loam and Dalhart and Vona loamy fine sand.

At all test sites, deep plowing more than doubled the average clay content of the top 4 inches of soil. The clay content averaged 5 percent before deep plowing and 12 percent immediately after plowing.

The clay remained in the surface soil as long as there was little or no wind, but it was rapidly depleted under severe-wind conditions. To halt soil blowing, the scientists say, the surface soil would have to contain about 27 percent clay.

A new herbicide for rice

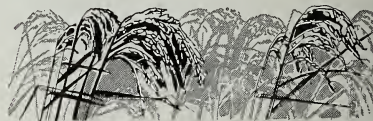
Preliminary field research in southern rice fields indicates that a new herbicide, called swep, may control barnyardgrass on farms where conditions limit the effectiveness of present herbicides.

DPA (3,4-dichloropropionanilide), a herbicide most widely used to kill grass weeds in rice, controls barnyardgrass and other weeds when it can be followed quickly by flooding to reduce the emergence of weeds after the herbicide treatment. The herbicide kills young weeds on contact, but it lacks the necessary residual effect to kill weeds that emerge after treatment.

On some farms, limited water supplies delay flooding after DPA is

applied. Also, quick flooding may be a hazardous practice on rice farms where the soil is alkaline, because the young rice may be injured.

The tests of swep (methyl 3,4-dichlorocarbanilate) were conducted by ARS agronomist R. J. Smith, Jr., in cooperation with the Arkansas Agricultural Experiment Station.



Smith found that in preemergence treatments, the residual action of swep prevented new barnyardgrass growth for 10 to 15 days. This is long enough, in many cases, to prevent weed growth between herbicide application and delayed flooding. In postemergence treatments, swep killed barnyardgrass that wasn't beyond the 4-leaf stage.

The tests also showed that swep was most effective when applied at the rate of 3 to 4 pounds in 15 to 20 gallons of water per acre. Higher application rates were harmful to the rice crop and lower application rates did not control any of the grass weeds.

Young rice plants proved tolerant to swep, but older plants (those with 2 or more leaves) were sometimes injured.

Approval of swep for use by farmers depends on the outcome of further research on its performance and studies to determine whether it leaves any harmful residues.